

CLAIMS

1. A retry communication control method for a packet communication system that includes a plurality of packet transfer apparatuses (10a, 10b, 10c) each connected to a network (1000) and to at least one terminal apparatus (40a - 40e) and is capable of exchanging packets between the terminal apparatuses according to priority levels assigned to the packets, comprising:

10 sending (S1) packets of a trial class for a predetermined period (T1) from a caller terminal apparatus;

estimating (S3) whether or not the communication quality of the packets is sufficient;

15 if it is sufficient, sending (S4) packets of a priority class thereafter;

if it is insufficient, stopping (S5) to send packets of the trial class for a second predetermined period (T2);

20 after the second predetermined period, estimating (S6) according to a monitored traffic rate (CA) of packets of the priority class whether or not it is possible to send packets of the trial class; and

25 if it is possible, again sending (S1) packets of the trial class for the predetermined period (T1) from the caller terminal apparatus.

2. A retry communication control method for a packet

communication system that includes a plurality of packet transfer apparatuses (10a, 10b, 10c) each connected to a network (1000) and to at least one terminal apparatus (40a - 40e) and is capable of exchanging packets between
5 the terminal apparatuses according to priority levels assigned to the packets, comprising:

 sending (S11) packets of a trial class for a predetermined period (T1) from a caller terminal apparatus;

10 estimating (S13) whether or not the communication quality of the packets is sufficient;

 if it is sufficient, sending (S14) packets of a priority class thereafter;

15 if it is insufficient, stopping (S15) to send packets of the trial class for a second predetermined period (T2);

20 after the second predetermined period, estimating (S16) according to a communication quality level (CQ) of the preceding trial-class packets whether or not it is possible to send packets of the trial class; and

 if it is possible, again sending (S11) packets of the trial class for the predetermined period (T1) from the caller terminal apparatus.

25 3. A retry communication control method for a packet communication system that includes a plurality of packet transfer apparatuses (10a, 10b, 10c) each connected to a network (1000) and to at least one terminal apparatus

(40a - 40e) and is capable of exchanging packets between the terminal apparatuses according to priority levels assigned to the packets, comprising:

5 sending (S21) packets of a trial class for a predetermined period (T1) from a caller terminal apparatus;

estimating (S23) whether or not the communication quality of the packets is sufficient;

10 if it is sufficient, sending (S24) packets of a priority class thereafter;

if it is insufficient, stopping (S25) to send packets of the trial class for a second predetermined period (T2);

15 after the second predetermined period, estimating (S26) whether or not it is possible to send packets of the trial class according to an execution probability estimated from a communication quality (CQ) of the preceding trial-class packets; and

20 if it is possible, again sending (S21) packets of the trial class for the predetermined period (T1) from the caller terminal apparatus.

4. A retry communication control method for a packet communication system that includes a plurality of packet transfer apparatuses (10a, 10b, 10c) each connected to a network (1000) and to at least one terminal apparatus (40a - 40e) and is capable of exchanging packets between the terminal apparatuses according to priority levels

assigned to the packets, comprising:

starting (S31) to send packets of a trial class from a caller terminal apparatus;

5 estimating (S33) from time to time whether or not the communication quality of the packets is sufficient;

 if it is sufficient and if the sufficient state continues for a predetermined period (T1), sending (S35) packets of a priority class;

10 if it becomes insufficient, immediately stopping (S36) to send packets of the trial class and continuously stopping to send packets of the trial class for a second predetermined period (T3);

15 after the second predetermined period, estimating (S37) whether or not it is possible to send packets of the trial class; and

 if it is possible, again sending (S31) packets of the trial class from the caller terminal apparatus.

5. The retry communication control method of any one
20 of claims 1 to 4, wherein the caller terminal apparatus
 is charged for a fee from the time when starting to
 transfer packets of the priority class.

6. A retry communication control system including a
25 plurality of packet transfer apparatuses (10a, 10b, 10c)
 each connected to a network (1000) and to at least one
 terminal apparatus (40a - 40e), packets of a trial class
 being sent from one terminal apparatus to another to

determine, according to the communication quality of the sent packets, whether or not it is possible to send packets of a priority class, comprising:

means for sending packets of the trial class for
5 a predetermined period (T1);

means for estimating whether or not the communication quality of the packets is sufficient;

means for sending, if it is sufficient, packets of the priority class thereafter;

10 means for stopping, if it is insufficient, to send packets of the trial class for a second predetermined period (T2);

means for estimating, after the second predetermined period, according to a monitored traffic rate (CA) of packets of the priority class whether or 15 not it is possible to send packets of the trial class; and

means for again sending, if it is possible, packets of the trial class for the predetermined period (T1)
20 from a caller terminal apparatus.

7. The retry communication control system of claim 6, wherein each of the terminal apparatuses (40a - 40e) has each of the means.

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8. The retry communication control system of claim 6, wherein each of the packet transfer apparatuses (10a, 10b, 10c) has each of the means.

9. The retry communication control system of claim 6,
further comprising:

5 a call control apparatus to start charging a caller
terminal apparatus for a fee when the transfer of packets
of the priority class is started.

10. A retry communication control system including a
plurality of packet transfer apparatuses (10a, 10b, 10c)
10 each connected to a network (1000) and to at least one
terminal apparatus (40a - 40e), packets of a trial class
being sent from one terminal apparatus to another to
determine, according to the communication quality of
the sent packets, whether or not it is possible to send
15 packets of a priority class, comprising:

means for sending packets of the trial class for
a predetermined period (T1);

means for estimating whether or not the
communication quality of the packets is sufficient;

20 means for sending, if it is sufficient, packets
of the priority class thereafter;

means for stopping, if it is insufficient, to send
packets of the trial class for a second predetermined
period (T2);

25 means for estimating, after the second
predetermined period, according to a communication
quality level (CQ) of the preceding trial-class packets
whether or not it is possible to send packets of the

trial class; and

means for again sending, if it is possible, packets of the trial class for the predetermined period (T1) from a caller terminal apparatus.

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11. The retry communication control system of claim 10, wherein each of the terminal apparatuses (40a - 40e) has each of the means.

10 12. The retry communication control system of claim 10, wherein each of the packet transfer apparatuses (10a, 10b, 10c) has each of the means.

13. The retry communication control system of claim 15 10, further comprising:

a call control apparatus to start charging a caller terminal apparatus for a fee when the transfer of packets of the priority class is started.

20 14. A retry communication control system including a plurality of packet transfer apparatuses (10a, 10b, 10c) each connected to a network (1000) and to at least one terminal apparatus (40a - 40e), packets of a trial class being sent from one terminal apparatus to another to 25 determine, according to the communication quality of the sent packets, whether or not it is possible to send packets of a priority class, comprising:

means for sending packets of the trial class for

a predetermined period (T1);

means for estimating whether or not the communication quality of the packets is sufficient;

means for sending, if it is sufficient, packets
5 of the priority class thereafter;

means for stopping, if it is insufficient, to send packets of the trial class for a second predetermined period (T2);

means for estimating, after the second
10 predetermined period, whether or not it is possible to send packets of the trial class according to an execution probability estimated from a communication quality (CQ) of the preceding trial-class packets; and

means for again sending, if it is possible, packets
15 of the trial class for the predetermined period (T1)
from a caller terminal apparatus.

15. The retry communication control system of claim
14, wherein each of the terminal apparatuses (40a - 40e)
20 has each of the means.

16. The retry communication control system of claim
14, wherein each of the packet transfer apparatuses (10a,
10b, 10c) has each of the means.

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17. The retry communication control system of claim
14, further comprising:

a call control apparatus to start charging a caller

terminal apparatus for a fee when the transfer of packets of the priority class is started.

18. A retry communication control system including a plurality of packet transfer apparatuses (10a, 10b, 10c) each connected to a network (1000) and to at least one terminal apparatus (40a - 40e), packets of a trial class being sent from one terminal apparatus to another to determine, according to the communication quality of the sent packets, whether or not it is possible to send packets of a priority class, comprising:

means for starting to send packets of the trial class;

means for estimating from time to time whether or not the communication quality of the packets is sufficient;

means for sending, if the communication quality is sufficient and if the sufficient state continues for a predetermined period (T1), packets of the priority class;

means for immediately stopping, if the communication quality becomes insufficient, to send packets of the trial class and continuously stopping to send packets of the trial class for a second predetermined period (T3);

means for estimating, after the second predetermined period, whether or not it is possible to send packets of the trial class; and

means for again sending, if it is possible, packets of the trial class from a caller terminal apparatus.

19. The retry communication control system of claim
5 18, wherein each of the terminal apparatuses (40a - 40e) has each of the means.

20. The retry communication control system of claim
10 18, wherein each of the packet transfer apparatuses (10a, 10b, 10c) has each of the means.

21. The retry communication control system of claim
18, further comprising:

a call control apparatus to start charging a caller
15 terminal apparatus for a fee when the transfer of packets of the priority class is started.

22. A program installed in a packet communication system that includes a plurality of packet transfer apparatuses
20 (10a, 10b, 10c) each connected to a network (1000) and to at least one terminal apparatus (40a - 40e) and is capable of exchanging packets between the terminal apparatuses according to priority levels assigned to the packets, the program making the packet communication
25 system execute:

a procedure (S1) of sending packets of a trial class for a predetermined period (T1) from a caller terminal apparatus;

a procedure (S3) of estimating whether or not the communication quality of the packets is sufficient;

5 a procedure (S4) of sending, if the communication quality is sufficient, packets of a priority class thereafter;

a procedure (S5) of stopping, if the communication quality is insufficient, to send packets of the trial class for a second predetermined period (T2);

10 a procedure (S6) of estimating, after the second predetermined period, according to a monitored traffic rate (CA) of packets of the priority class whether or not it is possible to send packets of the trial class;
and

15 a procedure (S1) of again sending, if it is possible, packets of the trial class for the predetermined period (T1) from the caller terminal apparatus.

23. A packet transfer possibility determination method for a packet transfer apparatus (11a - 11i) that transfers 20 packets from a first terminal apparatus (such as 50a) to a second terminal apparatus according to a packet transfer priority level, i.e., a trial class or a priority class specified by a transfer request from the first terminal apparatus, comprising:

25 presetting a trial-class band capacity (BWmh) not to discard packets of the trial class; and

if a total flow rate of packets of the trial and priority classes exceeds the trial-class band capacity

(BWmh), discarding packets of the trial class.

24. The packet transfer possibility determination method of claim 23, comprising:

5 if a total flow rate of packets including packets
of a new transmission request exceeds the trial-class
band capacity (BW_{mh}) , discarding the new packets if they
are of the trial class and passing them if they are of
the priority class.

10 25. The packet transfer possibility determination
method of claim 24, comprising:

method of presetting a priority-class band capacity (BWh) not to discard packets of the priority class; and

15 if a total flow rate of packets including packets
of the priority class of a new transmission request
exceeds the priority-class band capacity (BWh),
discarding the new packets of the priority class.

20 26. The packet transfer possibility determination
method of claim 23, comprising:

27. The packet transfer possibility determination

method of claim 26, comprising:

presetting a priority-class band capacity (BWh)
not to discard packets of the priority class; and
if a total flow rate exceeds the priority-class
5 band capacity (BWh) due to a communication band expansion,
discarding packets of the priority class.

28. The packet transfer possibility determination method of any one of claims 23 to 27, wherein the terminal apparatus (such as 50a) makes a request of transmitting packets of the trial class, and according to a resultant transmission quality, makes a request of transmitting packets of the priority class or again of the trial class.

15 29. A packet transfer apparatus (11a - 11i) for transferring packets from a first terminal apparatus (such as 50a) to a second terminal apparatus according to a packet transfer priority level, i.e., a trial class or a priority class specified by a transfer request from 20 the first terminal apparatus, comprising:

a storage part (1112) prestoring a trial-class band capacity (BWmh) not to discard packets of the trial class;
and

a flow-rate monitor part (1112) to discard packets of the trial class if a total flow rate of packets of the trial and priority classes exceeds the trial-class band capacity (BWmh).

30. The packet transfer apparatus of claim 29, wherein,
if a total flow rate of packets including packets of
a new transmission request exceeds the trial-class band
capacity (B_{Wmh}), the flow-rate monitor part (1112)
5 discards the new packets if they are of the trial class
and passes them if they are of the priority class.

31. The packet transfer apparatus of claim 30, wherein:
the storage part (1112) prestores also a
10 priority-class band capacity (B_{Wh}) not to discard
packets of the priority class; and
if a total flow rate of packets including packets
of the priority class of a new transmission request
exceeds the priority-class band capacity (B_{Wh}), the
15 flow-rate monitor part (1112) discards the new packets
of the priority class.

32. The packet transfer apparatus of claim 29, wherein
packets are transferred in communication-band-variable
20 flows, and if a total flow rate exceeds the trial-class
band capacity (B_{Wmh}) due to a communication band
expansion, the flow-rate monitor part (1112) discards
packets of the trial class.

25 33. The packet transfer apparatus of claim 32, wherein:
the storage part (1112) prestores also a
priority-class band capacity (B_{Wh}) not to discard
packets of the priority class; and

if a total flow rate exceeds the priority-class band capacity (BWh) due to a communication band expansion, the flow-rate monitor part (1112) discards packets of the priority class.

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34. The packet transfer apparatus of claim 29, comprising:

a plurality of circuits (A, B) each capable of transferring packets of the priority and trial classes
10 and being monitored by the flow-rate monitor part (1112),

wherein, if at least one of the circuits fails so that all flows of packets in the failed circuit are switched to at least a second of the circuits and if a total flow rate of packets of the trial and priority
15 classes in the second circuit exceeds the trial-class band capacity ($BWmh$), the flow-rate monitor part (1112) discards packets of the trial class.

35. The packet transfer apparatus of claim 29, wherein
20 the terminal apparatus is a mobile terminal apparatus (60b) that transmits packets by radio, and if a total flow rate of packets of the trial and priority classes exceeds the trial-class band capacity ($BWmh$) due to handover caused by a movement of the mobile terminal
25 apparatus, the flow-rate monitor part (1112) discards packets of the trial class.

36. A program installed in a packet transfer apparatus

(11a - 11i) for transferring packets from a first terminal apparatus (such as 50a) to a second terminal apparatus according to a packet transfer priority level, i.e., a trial class or a priority class specified by a transfer request from the first terminal apparatus, the program making the packet transfer apparatus (11a - 11i) execute:

5 a procedure of presetting a trial-class band capacity (BWmh) not to discard packets of the trial class; and

10 a procedure of discarding (S44) packets of the trial class if a total flow rate of packets of the trial and priority classes exceeds (S42) the trial-class band capacity (BWmh).

15 37. A packet transfer system (1a) comprising a plurality of terminal apparatuses (70a, 70b) that make a call setting request in a trial class as a packet transfer priority level, and according to a resultant communication quality, make a call setting request in 20 a priority class or again in the trial class, a plurality of packet transfer apparatuses (12a, 12d) that are interposed between the terminal apparatuses to transfer packets at their respective priority levels, and a call control apparatus (20) that manages the state of each 25 call originated from each terminal apparatus,

the call control apparatus (20) pre storing contract information that includes at least a priority-level-transition pattern available for the

terminal apparatuses controlled by the call control apparatus, and when a call is established, notifying the packet transfer apparatuses accommodating the call conducting terminal apparatuses of monitor information that includes information to identify packets exchanged in connection with the call and information that is used to determine whether or not the packets exchanged in connection with the call conform to the contract information and at least includes an identifier representative of the priority-level-transition pattern (S83),

the packet transfer apparatuses (12a, 12d) receiving the monitor information, estimating, according to the identifier, a priority level transition of packets from the terminal apparatuses concerning the call, and determining whether or not a type of service related to the priority level of each packet conforms to the contract information.

20 38. The packet transfer system of claim 37, wherein the packet transfer apparatus (12a, 12d), if determines that the type of service does not conform to the contract information, notifies the call control apparatus (20) of the same, and the call control apparatus (20) cuts 25 the communication related to the call.

39. The packet transfer system of claim 37, wherein the packet transfer apparatus (12a, 12d), if determines

that the type of service does not conform to the contract information, discards the packet.

40. The packet transfer system of claim 37, wherein
5 the packet transfer apparatus (12a, 12d), if determines
that the type of service does not conform to the contract
information, transfers the packet at a priority level
corresponding to a type of service conforming to the
contract information.

10 41. The packet transfer system of any one of claims
37 to 40, wherein the call control apparatus (20)
determines (S72, S74) whether or not a type of service
requested by a call setting request from the terminal
15 apparatus (70a, 70b) conforms to the contract
information, and if it does not conform to the contract
information, rejects (S76) the call setting request.

20 42. A packet transfer system (1a) comprising a plurality
of terminal apparatuses (70a, 70b) each making a call
setting request for transferring packets with a type
of service corresponding to one of a plurality of priority
levels, a plurality of packet transfer apparatuses (12a,
25 12d) interposed between the terminal apparatuses to
transfer packets from the terminal apparatuses at their
respective priority levels, and a call control apparatus
(20) managing the state of a call originated from each
terminal apparatus,

the call control apparatus (20) notifying, when a call is established, the packet transfer apparatuses accommodating the call conducting terminal apparatuses of monitor information that includes information to 5 identify packets exchanged in connection with the call and information to determine whether or not the packets exchanged in connection with the call conform to the contract information (S83),

the packet transfer apparatuses (12a, 12d) having a preset threshold value for a minimum flow rate of packets, 10 monitoring, upon receiving the monitor information, a flow rate of packets sent from the terminal apparatuses concerning the call, and if the flow rate is below the threshold value, notifying the call control apparatus 15 (20) of the same,

the call control apparatus (20) cutting the communication related to the call upon receiving the notification that the flow rate is below the threshold value.

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43. The packet transfer system of claim 42, wherein the packet transfer apparatus (12a, 12d) has a preset upper limit threshold value for a maximum flow rate of packets, and if a flow rate exceeds the upper limit 25 threshold value, notifies the call control apparatus (20) of the same, and the call control apparatus (20) cuts the communication related to the call when receiving the notification that the flow rate is above the upper

limit threshold value.

44. The packet transfer system of any one of claims
42 and 43, wherein the packet transfer apparatus (12a,
5 12d) monitors a flow rate of packets according to the
size of a token bucket (TB) and sets, as the threshold
value for the minimum flow rate of packets, a value (B1
+ B2) greater than an initial value (B1) of a token
counter.

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45. A packet monitor method for a packet transfer system
(1a) that makes a call setting request in a trial class
as a packet transfer priority level, and according to
a resultant communication quality, makes a call setting
15 request in a priority class or again in the trial class,
to transfer packets, the method comprising:

presetting contract information that includes at
least a priority-level-transition pattern available for
each user;

20 after a call is established, estimating a priority
level transition of packets to be transferred according
to monitor information that includes information to
identify packets exchanged in connection with the call
and information that is used to determine whether or
25 not the packets exchanged in connection with the call
conform to the contract information and at least includes
an identifier representative of the
priority-level-transition pattern, and determining

whether or not a type of service related to the priority level of a given packet conforms to the contract information.

5 46. A packet monitor method for a packet transfer system (1a) that makes a call setting request for transferring packets with a type of service corresponding to one of a plurality of priority levels and transfers packets at each priority level, the method comprising:

10 after a call is established, monitoring a flow rate of packets related to the call, and if the flow rate is below a preset threshold value for a minimum flow rate of packets, cutting communication related to the call.

15 47. A call control apparatus (20) for receiving a call setting request in a trial class as a packet transfer priority level, and according to a resultant communication quality, receiving a call setting request 20 in a priority class or again in the trial class, comprising:

25 a contract information storage part (205) to prestore contract information that includes at least a priority-level-transition pattern available for accommodating terminal apparatuses;

a contract information determination part (201) to determine, at a call setting request, whether or not the type of service of a call related to the call setting

request conforms to the contract information;
a monitor information notification part (203) to
notify, when a call is established, packet transfer
apparatuses accommodating terminal apparatuses that
5 conduct the call of monitor information that includes
information to identify packets exchanged in connection
with the call and information that is used to determine
whether or not the packets exchanged in connection with
the call conform to the contract information and at least
10 includes an identifier representative of the
priority-level-transition pattern; and
a call state management part (204) to cut
communication related to the call upon receiving
notification from the packet transfer apparatus that
15 the type of service of a given packet does not conform
to the contract information.

48. A packet transfer apparatus (12a, 12b) for
transferring a packet at a priority level corresponding
20 to a type of service of the packet, comprising:
a class transition monitor part (124a, 124d) to
receive monitor information that includes information
to identify packets exchanged in connection with a call
and information that is used to determine whether or
25 not the packets exchanged in connection with the call
conform to the contract information and at least includes
an identifier representative of a
priority-level-transition pattern, estimate,

according to the identifier, a priority level transition of packets from the terminal apparatus concerning the call, and determine whether or not the type of service related to the priority level of each packet conforms
5 to the contract information;

a packet discard part (122a, 122d) to discard the packet if it is determined that the type of service does not conform to the contract information; and

10 a packet rewrite part (121a, 121d) to rewrite the type of service into that conforming to the contract information if it is determined that the type of service does not conform to the contract information.

49. A packet transfer apparatus (12a, 12d) for
15 transferring a packet at a priority level corresponding to a type of service of the packet, comprising:

a packet-flow-ratemonitor part (124a, 124d) having a preset threshold value for a minimum flowrate of packets, to monitor, upon receiving monitor information that 20 includes information to identify packets exchanged in connection with a call and information to determine whether or not the packets exchanged in connection with the call conform to contract information, whether or not a flow rate of packets sent from terminal apparatuses 25 concerning the call is below the threshold value.

50. A packet transfer system (1b) including a plurality of packet transfer apparatuses (13a - 13d) interposed

between a plurality of terminal apparatuses (80a, 80b) to transfer packets at their respective priority levels, comprising:

5 a monitor apparatus (30) to monitor packets; and
a call control apparatus (21) to control the state of a call between the terminal apparatuses, determine whether or not packets related to the call must be monitored, and if the packets must be monitored, pass the packets through the monitor apparatus (30).

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51. The packet transfer system of claim 50, wherein:
the call control apparatus (21), if determines to monitor packets related to the call, notifies the terminal apparatuses (80a, 80b) that exchange packets related to the call of an address of the monitor apparatus (30) as a destination address and transmits a monitor start instruction including addresses of the terminal apparatuses (80a, 80b) that exchange packets related to the call to the monitor apparatus (30); and
20 the monitor apparatus (30), upon receiving the monitor start instruction, monitors each packet whose originator address is a first of the terminal apparatus addresses contained in the monitor start instruction, rewrites a destination address of the packet into a second of the terminal apparatus addresses contained in the monitor start instruction, and transmits the packet.
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52. A packet transfer system (1c, 1d, 1e) including

a plurality of packet transfer apparatuses (14a - 14d, 15a, 16a - 16d) interposed between a plurality of terminal apparatuses (80a, 80b) to transfer packets at their respective priority levels from a caller terminal apparatus to a destination terminal apparatus,
5 comprising:

a monitor apparatus (30a, 31, 32, 33, 341, 342) to monitor packets; and

10 a call control apparatus (22, 23) to control the state of a call between the terminal apparatuses and send a packet that must be transferred and monitored to the monitor apparatus (30a, 31, 32, 33, 341, 342).

53. The packet transfer system of claim 52, wherein:
15 the call control apparatus (22), if there is a packet to be transferred and monitored, notifies each of the packet transfer apparatuses (14a, 14d) accommodating the terminal apparatuses related to the communication of the packet to be monitored of addresses of the terminal apparatuses related to the communication of the packet to be monitored
20 to the monitor apparatus;
25 the packet transfer apparatuses (14a, 14d) receive the addresses of the terminal apparatuses related to the communication of the packet to be monitored, rewrite a destination address of the packet whose originator

address is in the notified addresses into an address of the monitor apparatus (31), and transmit the packet; and

the monitor apparatus (31) receives the monitor start instruction, monitors the packet whose originator address is in the terminal apparatus addresses contained in the monitor start instruction, rewrites the destination address of the packet into the address of the destination terminal apparatus contained in the monitor start instruction, and transmits the packet.

54. The packet transfer system of claim 52, wherein:

the packet transfer apparatuses (16a - 16d) transfer packets according to multi-protocol label switching (MPLS) and have a preset label switch path (LSP) for passing through the monitor apparatus between all terminal apparatuses pass;

the call control apparatus (33), when monitoring transferred packets, notifies the packet transfer apparatuses (16a, 16d) accommodating the terminal apparatuses related to the communication of monitored packets of addresses of the terminal apparatuses related to the communication of monitored packets; and

the packet transfer apparatuses (16a, 16d), upon receiving the notification of the addresses of the terminal apparatuses related to the communication of monitored packets, set an LSP label for passing through the monitor apparatus as an MPLS label of each monitored

packet to be sent from the terminal apparatus having the notified address to a destination terminal apparatus.

- 5 55. The packet transfer system of claim 52, wherein:
the monitor apparatus (33) is connected so as to obtain a packet from a path between two predetermined packet transfer apparatuses (16c, 16d), the packet transfer apparatuses (16a - 16d) transfer packets
10 according to multi-protocol label switching (MPLS), and the packet transfer apparatuses (16a - 16d) have a preset label switch path (LSP) between all terminal apparatuses, the preset LSP including a path between the two predetermined packet transfer apparatuses;
- 15 the call control apparatus (23), when monitoring transferred packets, notifies the packet transfer apparatuses (16a, 16d) accommodating the terminal apparatuses related to the communication of monitored packets of addresses of the terminal apparatuses related to the communication of monitored packets; and
20 the packet transfer apparatuses (16a, 16d), upon receiving the notification of the addresses of the terminal apparatuses related to the communication of monitored packets, set an LSP label for passing through the path between the two packet transfer apparatuses (16c, 16d) as an MPLS label of each monitored packet
25 to be sent from the terminal apparatus having the notified address to a destination terminal apparatus.

56. The packet transfer system of claim 52, wherein:
each packet transfer apparatus (15a) has an output
port corresponding to the monitor apparatus;

5 the call control apparatus, when monitoring
transferred packets, notifies each packet transfer
apparatus (15a) accommodating a terminal apparatus
related to the communication of monitored packets of
addresses of terminal apparatuses related to the
10 communication of monitored packets; and

15 the packet transfer apparatus (15a), upon receiving
the notification of the addresses of the terminal
apparatuses related to the communication of monitored
packets, copies a packet passing through a port
corresponding to the address of the terminal apparatus
related to the communication of monitored packets to
the output port corresponding to the monitor apparatus.

57. The packet transfer system of any one of claims
20 52 to 56, further comprising:

input means (91) capable of identifying the packets
to be monitored.

58. The packet transfer system of claim 57, wherein
25 an instruction to specify a specific call is entered
in the input means (91) to identify the packets to be
monitored.

59. The packet transfer system of claim 57, wherein an instruction to specify a specific terminal apparatus is entered in the input means (91) to identify the packets to be monitored.

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60. The packet transfer system of claim 57, wherein an instruction to specify a specific user is entered in the input means (91) to identify the packets to be monitored.

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61. The packet transfer system of any one of claims 52 to 56, wherein the call control apparatus (22, 23) has a communication history management part (212) to record monitored results for each terminal apparatus and for each user, and when a new communication request is made by a terminal apparatus or by a user, identifies the packets to be monitored according to the monitored results.

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62. The packet transfer system of any one of claims 52 to 56, wherein the call control apparatus (22, 23), when a new communication request is made, identifies the packets to be monitored according to a communication attribute written in a call control signal.

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63. The packet transfer system of any one of claims 52 to 56, wherein the call control apparatus (22, 23), when a new communication request is made, identifies

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the packets to be monitored according to routed apparatus information written in a call setting signal.

64. The packet transfer system of any one of claims
5 50 to 56, wherein the monitor apparatus (30a) has a test
packet monitor part (303) that monitors only test packets
of a trial class.

65. The packet transfer system of any one of claims
10 50 to 54, wherein the monitor apparatus (30, 31, 32,
30a), when transferring a received packet to a destination terminal apparatus, intentionally discards the received packet, and if receiving a report that the discarded packet has correctly been received, determines
15 that the destination terminal apparatus is a maliciously operating terminal apparatus.

66. A packet monitor method for a packet transfer system (1b) including a plurality of packet transfer apparatuses (13a - 13d) interposed between a plurality of terminal apparatuses (80a, 80b) to transfer packets at their respective priority levels, a call control apparatus (21) to control the state of a call between the terminal apparatuses, and a monitor apparatus (30)
25 to monitor the packets, comprising:

at the call control apparatus (21), determining (S91), upon receiving a call setting request, whether or not packets for the call must be monitored;

at the call control apparatus (21), if determining to monitor the packets, notifying (S92) the terminal apparatuses that exchange packets for the call of an address of the monitor apparatus as a destination address;

at the call control apparatus (21), transmitting (S101) to the monitor apparatus (30) a monitor start instruction including addresses of the terminal apparatuses that exchange packets for the call;

at the monitor apparatus (30), upon receiving the monitor start instruction, monitoring (S112) each packet whose originator address is a first of the terminal apparatus addresses contained in the monitor start instruction; and

at the monitor apparatus (30), rewriting (S113) a destination address of the packet into a second of the terminal apparatus addresses contained in the monitor start instruction and transmitting (S115) the packet.

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67. A packet monitor method for a packet transfer system (1c) including a plurality of packet transfer apparatuses (14a to 14d) interposed between a plurality of terminal apparatuses (80a, 80b) to transfer packets at their respective priority levels, a call control apparatus (22) to control the state of a call between the terminal apparatuses, and a monitor apparatus (31) to monitor the packets, comprising:

at the call control apparatus (22), if monitoring transferred packets, notifying the packet transfer apparatuses (14a, 14d) accommodating the terminal apparatuses that exchange the packets to be monitored
5 of addresses of the terminal apparatuses that exchange the packets to be monitored;

at the call control apparatus (22), transmitting to the monitor apparatus a monitor start instruction containing the addresses of the terminal apparatuses
10 that exchange the packets to be monitored;

at the packet transfer apparatuses (14a, 14d), after receiving the addresses of the terminal apparatuses that exchange the packets to be monitored, rewriting a destination address of each packet whose
15 originator address is in the notified addresses into the address of the monitor apparatus (31), and transmitting the packet;

at the monitor apparatus (31), after receiving the monitor start instruction, monitoring (S132) each packet
20 whose originator address is in the terminal apparatus addresses contained in the monitor start instruction; and

at the monitor apparatus (31), rewriting (S133) the destination address of the packet into the address
25 of the destination terminal apparatus contained in the monitor start instruction and transmitting (S134) the packet.

68. A packet monitor method for a packet transfer system
(1d) including a plurality of packet transfer apparatuses (16a - 16d) interposed between a plurality of terminal apparatuses (80a, 80b), transferring packets
5 according to multi-protocol label switching (MPLS), and having a preset label switch path (LSP) for passing through a monitor apparatus between all terminal apparatuses, a call control apparatus (23) to manage the state of a call between the terminal apparatuses,
10 and the monitor apparatus (32) to monitor packets, comprising:

at the call control apparatus (23), when monitoring transferred packets, notifying the packet transfer apparatuses (16a, 16d) accommodating the terminal apparatuses that exchange the packets to be monitored of addresses of the terminal apparatuses that exchange the packets to be monitored; and

at the packet transfer apparatuses (16a, 16d), after receiving the notification of the addresses of the terminal apparatuses that exchange the packets to be monitored, setting (S142, S143) an LSP label for passing through the monitor apparatus as an MPLS label of a packet to be sent from the terminal apparatus having the notified address to a destination terminal apparatus.

69. A packet monitor method for a packet transfer system
(1e) including a plurality of packet transfer

apparatuses (16a - 16d) interposed between a plurality of terminal apparatuses (80a, 80b), transferring packets according to multi-protocol label switching (MPLS), and having a preset label switch path (LSP) for passing 5 through a monitor apparatus between all terminal apparatuses, a call control apparatus (23) to manage the state of a call between the terminal apparatuses, and the monitor apparatus (33) connected so as to obtain packets from a path between two predetermined packet 10 transfer apparatuses and monitoring the packets, comprising:

at the call control apparatus (23), when monitoring transferred packets, notifying the packet transfer apparatuses (16a, 16d) accommodating the terminal apparatuses that exchange the packets to be monitored of addresses of the terminal apparatuses that exchange 15 the packets to be monitored; and

at the packet transfer apparatuses (16a, 16d), after receiving the notification of the addresses of 20 the terminal apparatuses that exchange the packets to be monitored, setting an LSP label for passing through the path between the two predetermined packet transfer apparatuses as an MPLS label of each packet to be sent from the terminal apparatus having the notified address 25 to a destination terminal apparatus.

70. A packet monitor method for a packet transfer system including a monitor apparatus to monitor packets, a

plurality of packet transfer apparatuses (15a) interposed between a plurality of terminal apparatuses, having an output port corresponding to the monitor apparatus, and transferring packets at their respective priority levels, and a call control apparatus to manage the state of a call between the terminal apparatuses, comprising:

at the call control apparatus, when monitoring transferred packets, notifying the packet transfer apparatuses (15a) accommodating the terminal apparatuses that exchange the packets to be monitored of addresses of the terminal apparatuses that exchange the packets to be monitored; and

at the packet transfer apparatuses (15a), after receiving the notification of the addresses of the terminal apparatuses that exchange the packets to be monitored, copying each packet passing through a port corresponding to one of the addresses of the terminal apparatuses that exchange the packets to be monitored to the output port corresponding to the monitor apparatus.

71. A call control apparatus comprising:

a call state management part (213) to manage the state of a call between terminal apparatuses (80a, 80b);

a monitor object determination part (214) to determine, when receiving a request for setting a call, whether or not packets related to the call must be

monitored and whether or not the call must be monitored;

an address notification part (215) to notify, when it is determined that packets related to the call must be monitored, the terminal apparatuses that exchange 5 packets related to the call of an address of a monitor apparatus as a destination address; and

a monitor communication part (216) to transmit to the monitor apparatus a monitor start instruction containing addresses of the terminal apparatuses that 10 exchange packets related to the call.

72. A call control apparatus comprising:

a call state management part (213) to manage the state of a call between terminal apparatuses;

15 an address notification part (215) to notify, when it is determined that packets exchanged between the terminal apparatuses must be monitored, packet transfer apparatuses accommodating the terminal apparatuses that exchange the packets to be monitored of addresses of the terminal apparatuses that exchange the packets to 20 be monitored; and

a monitor communication part (216) to transmit to a monitor apparatus a monitor start instruction containing the addresses of the terminal apparatuses 25 that exchange the packets to be monitored.

73. A packet transfer apparatus comprising:

a packet transfer part (141a, 141d) to transfer

a packet at a priority level from a caller terminal apparatus to a destination terminal apparatus; and

5 a packet rewrite part (142a, 142d) to rewrite, upon receiving a notification of addresses of terminal apparatuses that exchange packets to be monitored, a destination address of a packet whose originator address is in the notified addresses into an address of a monitor apparatus.

10 74. A packet transfer apparatus comprising:

a packet transfer part (161a, 161d) to transfer a packet at a priority level from a caller terminal apparatus to a destination terminal apparatus; and

15 a label rewrite part (162a, 162d) to set, upon receiving a notification of addresses of terminal apparatuses that exchange packets to be monitored, an LSP label for passing through a monitor apparatus as an MPLS label of a packet to be sent from a terminal apparatus whose address is in the notified addresses 20 to a destination terminal apparatus.

75. A monitor apparatus comprising:

a packet monitor part (301) to monitor, upon receiving a monitor start instruction, each packet whose 25 originator address is a terminal apparatus address contained in the monitor start instruction; and

a packet rewrite part (302) to rewrite a destination address of the monitored packet into an address of a

destination terminal apparatus that is in the monitor start instruction and relates to the communication of the monitored packet.